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Feature **Buildings** **November, 2006**

Published in BUILDINGS

What Owners Need to Know About Commissioning Buildings

All buildings should work well; unless they are commissioned, they probably won't

Millions of dollars are often spent in the construction of a new building. Advanced technologies for construction management, engineering design, and fabrication and installation are being applied to design and construct buildings, as well as to manage the construction process. It is becoming standard for high-tech equipment, controls, and communications systems to be put into the building to provide power, lighting, comfort, communications, security, and life-safety protection. In addition, some owners are deciding to go even further, expending the effort to make the building perform to a green standard determined by the U.S. Green Building Council's LEED® rating system. To make certain that all systems realize their full capabilities, commissioning - a relatively new process in the buildings industry - can ensure that new buildings are properly designed, constructed, and prepared for occupancy, operations, and maintenance. Existing buildings can also undergo a commissioning process called "retrocommissioning."

What is Commissioning?
Commissioning involves investigations that yield findings toward improving building operations and maintenance, and tuning up building systems so they use less energy with greater efficacy. While there are some standards and many guidelines, there is no universally accepted definition of commissioning. Additionally, the level and quality of commissioning services vary widely throughout the industry; it is more often the scope

Building Commissioning Assn

Key Concepts

- Commissioning can ensure that new buildings are properly designed, constructed, and prepared for occupancy, operations, and maintenance.
- Existing buildings can also undergo a commissioning process called "retrocommissioning."
- All buildings need to work well; unless they are

of commissioning that is debated, not the definition. Among the primary missions of the Building Commissioning Association (BCA) is to help stabilize the commissioning field by promulgating commissioning best practices and raising awareness among building owners about the need for commissioning and procuring quality commissioning services.

Any building type and size can be commissioned. Common questions involve whether every building *should* be commissioned and what the scope will be if the building is to be commissioned. The short answer to these questions is that it depends on building size and complexity, but size and complexity are not always related. All buildings need to work well; unless they are commissioned, they probably will not.

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- Commissioning has been around long enough for credible statistics to emerge.

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Commissioning Providers
Firms that provide commissioning services include independent third-party commissioning providers (firms that focus only on commissioning), contractors, consulting engineers, design/build firms, manufacturers, and more. There is varying opinion as to whether third-party commissioning providers are needed on all projects, but there is in an obvious need to avoid a "foxes-watching-the-henhouse" situation if individuals involved in the construction team should lead a commissioning effort.

The Value of the Commissioning Market
Commissioning is a rapidly growing market. A study conducted by FMI, a Raleigh, NC-headquartered consulting firm for the construction industry, indicates that the commissioning market for new buildings increased from $114 million in 2001 to $806 million in 2004, a growth of more than 600 percent. Yet, commissioning still makes up less than 1 percent of the total construction market ($390 billion). FMI forecasts that the commissioning market will grow another 65 percent in the next 3 years to become a $1.3-billion segment of the construction industry.

These figures are interesting, but the study did not address the scope of commissioning. A closer look is required to tell precisely how these commissioning dollars are being spent.

You Get What You Pay For
The BCA, which consists of more than 530 member firms and individuals, maintains a list of 13 "attributes of commissioning" considered to be so fundamental to effective building commissioning that all members agree (in writing) to adhere to them whenever they serve as a project's commissioning authority. The attributes cover everything from the knowledge and skills required of a commissioning authority to the way to conduct business. The BCA website (www.bcxa.org) has the attributes available in its "About BCA" section.

With the scope and quality of commissioning varying widely throughout the industry, the BCA has also established what a typical commissioning scope should include, called "Valuable Elements of Building Commissioning." This can be found on the BCA website as well.

The BCA has also formalized many commissioning practices into template documents that owners and providers can use on projects, including language for requests for proposals (RFPs), commissioning-services contracts, and checklists and test procedures for commissioning providers.

Cost-Benefit Study
Most owners want to know what the bottom line of commissioning is. How much does it cost?

Do the costs yield benefits that make commissioning a sound investment? Answers to these questions, like anything having to do with buildings, depend on the particular situation. However, commissioning has now been around long enough for some reasonably credible statistics to emerge.

A major study of commissioning costs and benefits was published in 2004, including 224 buildings and 175 commissioning projects of both existing buildings and new construction. These projects represented a total commissioning investment of $17 million and were implemented by 18 commissioning providers.

The study looked at commissioning benefits from energy and non-energy perspectives. Examples of the many non-energy benefits of commissioning and retrocommissioning included reduced change orders resulting from early detection of problems during design and construction, and the correction of premature equipment breakdown.

The authors of the study concluded that: "Commissioning is one of the most cost-effective means of improving energy efficiency in commercial buildings. While not a panacea, it can play a major and strategically important role in achieving national energy-savings goals. If the results observed across the sample in this study are representative of the practice and potential of commissioning more broadly, significant energy savings could be achieved nationally. Specifically, if the median project performance were to be achieved over the entire commercial-buildings stock (essentially, an economic potential, not adjusted for partial penetration rates), the full cost-effective potential would amount to 15 percent of the $120-billion annual energy bills for the sector (as of 2002). This translates into savings of $18 billion annually among existing commercial buildings. In practice, the fraction of the full stock ultimately reached will depend on the effectiveness of public and private efforts to build the market for this emerging service."

Commissioning is needed as a quality-assurance measure for today's complex building designs and equipment, and fast-paced construction timelines. The economic ramifications for delayed occupancy and the early detection of design and installation faults alone can provide economic justification for many (if not most) commissioning projects. Energy savings can also reduce the payback period of commissioning investments, but should not be looked upon as the sole reason to commission or retrocommission a building. Advancing building operations and maintenance through improved documentation of systems and procedures; training building operators and managers will further improve return on investment for commissioning and the economic performance of a building.

Finally, if a building is pursuing LEED certification for new construction or an existing building, commissioning is probably going to be required. Owners should look at the latest version of LEED released by the USGBC to learn about significant, anticipated changes to commissioning requirements.

References and Resources
Michael English, author of this article, used a number of references, including:

- "Utilizing the Commissioning Tool Set," David Sellers, PE, *HPAC Engineering*, September 2003, pages 40-41.
- Commissioning ... *Delivering the Promise,* presentation at the National Conference on Building Commissioning by Scott Stutman and Michael C. English, PE, LEED AP, CCP, May 4, 2005.
- *Building Commissioning, Testing, Adjusting, and Balancing*, Draft Report, July 15, 2005, FMI.

- "The Cost-Effectiveness of Commissioning," Evan Mills, Hannah Friedman, Tehesia Powell, Norman Bourassa, David Claridge, Tudi Haasl, Mary Ann Piette, published in *HPAC FASTRACK* e-newsletter, June 2005, available at (www.hpac.com/fastrack/0605/mills0605.html).
- Full report available: *The Cost-Effectiveness of Commercial-Buildings Commissioning*, Evan Mills, Hannah Friedman, Tehesia Powell, Norman Bourassa, David Claridge, Tudi Haasl, Mary Ann Piette, published by Lawrence Berkeley National Laboratory, Report 56637, Dec. 15, 2004, available at (http://eetd.lbl.gov/Emills/PUBS/Cx-Costs-Benefits.html).

Additional resources include:

- *The Building Commissioning Handbook*, Second Edition, by John A. Heinz, PE, and Richard B. Casault, PE, published by The Association of Higher Education Facilities Officers and the Building Commissioning Association. Available at (www.bcxa.org).
- The California Commissioning Collaborative's online library of resources for owners and providers (www.cacx.org).
- *Commissioning for Great Buildings* white paper, published for building owners by the Building Commissioning Association, Feb. 25, 2006. Available at (www.bcxa.org) in the "Resources" section.

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